

THE CHILOPODA OF CALIFORNIA III

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Suborder Geophiloidea

The members of this suborder are distributed over the entire earth but prefer the warmer and damper regions, the majority occurring in the northern hemisphere. They are to be found in damp places under stones, logs, leaves, the bark of trees and logs, and in the humus of woods and gardens into which they descend, especially during dry periods such as recur in California.

In all the body is elongate and very slender and consists of from thirty-one up to one hundred and eighty-one segments, as in a California species here described for the first time. The number of segments varies not only from genus to genus and species but, with few exceptions, also within the species, the range in some species being very great. The number in most cases is quite regularly longer in females than in males, though the maximum for the one ordinarily overlaps the minimum for the other. The antennae are short and consist invariably of fourteen articles, excepting in occasionally met cases where the antennae have been broken and are in process of regeneration. Eyes are always lacking. A basal plate, the tergite to which the prehensorial feet belong, is always well developed; while a small plate, remnant of a preceding tergite, may or may not show between it and the caudal margin of the cephalic plate. The cephalic plate may or may not possess a transverse suture, the frontal suture, setting off the frontal region. The mandibles may bear only so-called pectinate lamellae, which consist of comb-like rows of slender bristles borne upon a common base or plate; or they may in addition, bear a strongly chitinized plate dentate along its distal edge, the dentate lamella, which, while usually entire, may be subdivided. The first maxillae usually have their coxae fused together at the median line to form a single plate or coxosternum, but, more rarely, they may be entirely separate; distad each maxilla presents an inner division and an outer one, the latter, the palpus, being usually biarticulate but sometimes entire; at the distal exterior angle of each coxa and of the first joint of the palpus proper there may be a membranous process or lappet. The second maxillae, often spoken of together as the labium, usually have the coxae fused in the middle line, though, as with the first pair, they may remain distinct; the palpi are, in all known California species, triarticulate and may or may not terminate in a claw. Each leg-bearing segment excepting the first and the last bears a pair of spiracles, each spiracle opening through a sclerite in the pleural region. The coxopleuræ (pseudopleuræ, pleuræ) of the last segment give exit through the so-called coxopleural pores to a number of glands which may be many or few and may open separately or into one of two common larger pits at the edge of the last ventral plate.

The fauna of California includes an exceedingly interesting representation of this suborder, showing a greater variety and richness than in any other section of the United States. The Californian families known may be thus separated.

Key to Families of the Suborder **Geophiloidea**

- a. Mandible with a dentate lamella and with one or more pectinate lamellæ.
 - b. Antennæ flattened, broad at base and attenuated distad; mandible with several pectinate lamellæ. Family *Himantariidae*
 - bb. Antennæ cylindrical, filiform, not broad at base and attenuated distad; mandible with a single pectinate lamella. Family *Schendylidae*
- aa. Mandible without any dentate lamella; with one or several pectinate lamellæ.
 - b. Mandible with two or more pectinate lamellæ; coxæ of first maxillæ entirely separate from each other; pleuræ of prehensorial segment exposed each side of basal plate.
 - c. Coxæ of second maxillæ broadly coalesced at middle; mandible with several pectinate lamellæ. Family *Mecistocephalidae*
 - cc. Coxæ of second maxillæ entirely separate; mandible with but two pectinate lamellæ. Family *Arrupidae* fam. nov.
 - bb. Mandible with but a single pectinate lamella; coxæ of first maxillæ fused with each other at least proximally; pleuræ of prehensorial segment not exposed each side of basal plate.
 - c. Labrum entire, uniformly chitinized, coalesced with the cephalic plate excepting at ends; hypopharynx strongly developed; palpi of first maxillæ thick, strongly arched together in a semicircle. Family *Tampiyidae* fam. nov.
 - cc. Labrum free (in ours); tripartite, or with the divisions clearly traceable if secondarily coalesced; hypopharynx not unusually developed; first maxillæ not thus strongly arched in a semicircle.
 - d. Median piece of labrum extending along surface of the lateral with which it is fused at least in part; at middle the edge bears two conspicuously larger and more strongly chitinized teeth; chitinous lines of prosternum well developed. Family *Soniphilidae*
 - dd. Median piece of labrum entirely free, not bearing at middle two teeth conspicuously larger and more strongly chitinized than those adjacent; chitinous lines absent or but weakly developed. Family *Geophilidae*

Family **Mecistocephalidæ**

In this family the cephalic lamina is long and relatively narrow. The antennæ are filiform. The prehensorial feet are strongly developed and much exposed at sides of head from above, the pleuræ of the segment also being distinctly exposed at the sides of the basal plate which is narrow. A prebasal plate is never present. The labium is tripartite with the median piece very narrow, its sides being parallel or nearly so. The mandibles bear several pectinate lamellæ but no truly dentate plate. The coxæ of the first maxillæ remain entirely distinct. No suprascutella or plates between tergites and spiraculiferous sclerite are present. The coxopleuræ are pierced with numerous pores which are mostly

scattered over the entire surface. Anal legs with six articles distad of the coxopleurae.

Mecistocephalus is the only North American genus of the family at present known.

Genus *Mecistocephalus* Newport

In this genus the head is very large with the cephalic lamina much longer than wide and uniformly narrowed from the front caudad. The antennae are rather large and are a little attenuated from the proximal and distad. The labrum has the middle piece very narrow and acutely pointed distad while the side pieces bear a fringe of very short pectine. In the first maxillae the branches are membranous distad. Anal legs without claws.

So far as known the number of legs is invariable for each species.

In California there are two species of this genus, *M. limatus* Wood and *M. anomalus* Chamberlin, which are easily separated on the basis of the number of pairs of legs, the former having forty-five and the latter forty-one pairs.

Mecistocephalus limatus Wood

This is one of the commonest members of the Geophiloiden in the central portion of the state and also ranges to the southern portion, though it is not often met with during the dry season. During the rainy months it often occurs in great numbers under the fallen leaves of wooded areas. It seems to be especially abundant about San Francisco Bay.

A large robust species often attaining a length of 60 mm. or more, while the head as a whole may be 2.5 to nearly 3 mm. across in large individuals. The body is conspicuously attenuated from the head caudad. The head and body are polished shining. Head and antennae dark reddish or chestnut in color; body and legs orange or rusty yellow, the dorsal scuta, especially on anterior portion of body, often with a narrow dark band along caudal edges. Antennae long, attenuated distad. The claws of the prehensors when closed extend nearly to the distal end of the first antennal article, each prehensor armed with four strongly chitinized teeth, one on each article, of which those of the first article and claw are largest. Anterior sterna with a deep longitudinal median sulcus which becomes less strongly developed caudad. First spiracle much larger than the second, vertically elliptical, the others circular or nearly so. Last ventral plate strongly narrowed caudad, triangular. Coxopleurae of last segment with numerous small pores and usually one larger one distributed over most of the surface, the number few in immature individuals. Pairs of legs in both sexes, so far as observed invariably forty-five.

Specimens have been examined from the following localities: Mill Valley, Sausalito, Berkeley (author); Stanford (Mann); and Claremont (Pomona College collection).

Mecistocephalus anomalus Chamberlin

This species in size, coloration and general structure is very close to the preceding one. It is readily separated in having invariably forty-one pairs of

legs as against the forty-five in *limatus*. The antennæ are typically smaller and shorter.

Found by the author to be very common during the wet season about Monterey Bay. Also taken at Oroville (April, 1911). In both of these places it appears wholly to replace *limatus*.

Family Arrupidæ fam. nov.

Differs from the preceding family (as represented in California) in having the three divisions of the labrum, of which the median is larger, entirely unarmed; in having the coxæ of the second maxillæ entirely separate; and in having the mandible with but two pectinate lamellæ.

Verhoeff's superfamily name *Placodesmata*, proposed for the *Mecistocephalidae*, may now, with better service, be employed to indicate the group formed by this family and the *Arrupidae*.

Genus Arrup gen. nov.

Labrum strongly chitimized, edges all smooth; the median piece broadly triangular, with the apex directed caudad. First maxillæ with the outer branch long, entire, membranous distad; no lappets. Palpus of second maxillæ triarticulate, without a claw. Last ventral plate wide, triangular; coxopleural pores few, small. Antennæ thick, sub-filiform. First joint of prehensors with a large, conical, strongly chitimized tooth; other joints unarmed. Anal legs unarmed.

Type.—*Arrup pylorus* sp. nov.

Arrup pylorus sp. nov.

Attenuated cephalad, more strongly caudad. Dorsum with a sharply impressed longitudinal median sulcus. Fulvous in color; head light reddish brown. Head widest anteriorly, narrowed to caudal margin which is truncate; anterior margin extended forward from sides to middle. Antennæ short, thick; all articles short, decreasing from basal ones to the penult; ultimate longer than the two preceding taken together. Basal plate overlapped by the cephalic; exposed portion very short, but little more than one-seventh as long as the cephalic, 4.8 times wider than long. Spiracles all circular, the first very much larger than the second. Last ventral plate wide, triangular, the sides converging caudad to meet at an angle. Coxopleural pores three or four on each side, small, adjacent to edge of last ventral plate. Anal legs in male crassate. Pairs of legs, forty-one. Length, 22 mm. (type).

Localities.—Sausalito and Berkeley (author, April, 1911).

Family Tampiyidæ fam. nov.

Labrum of one, uniformly chitimized piece, which is firmly coalesced with the labrum excepting at the ends where the suture may be detected; median portion conspicuously protruding, armed caudad with few stout teeth, the lateral portions pectinate. First maxillæ with outer branch distinctly biarticulate, the first article with a lappet, the apical joint thick, strongly bent inward and contiguous with its fellow. Palpi of second maxillæ triarticulate, ending in claws, which are simple, not toothed or pectinate. Prosternum with strongly developed

chitinous lines; its anterior median margin armed with two stout conical teeth. Suprascutella absent. Ventral pores absent. Antennae flattened but of equal width from base to apex, being not at all attenuated. Pores of coxopleuræ scattered.

This family is evidently very close to the *Gonibregmatidae*, a family occurring in the Philippines and East Indies, with which it forms a natural group. One genus at present known.

Genus *Tampiya* gen. nov.

Lateral portions of the labrum concave, each pectinate with few lightly chitinized processes or spines, the middle portion protruding caudad and distally truncate, bearing a row of stout, conical, highly chitinized teeth. Lappets of first maxilla very long. The claw of palpus of second maxilla long, smooth. Cephalic plate not wholly covering the prehensorial feet. Basal plate short, wider than cephalic plate. Chitinous lines very strongly developed. Anal legs with large claws. Hypopharynx strongly developed, bifurcate anteriorly. Spiracles all circular. Last ventral plate moderate; pores scattered over coxopleuræ.

Type.—*Tampiya pylorus* sp. nov., the only species thus far known.

Tampiya pylorus sp. nov.

Cephalic plate truncate caudad, the sides conspicuously convex, anterior portion sub-triangular; about equal in length and breadth. Antennæ rather narrow, flattened, of uniform width throughout. Palpi of second maxilla conspicuously flattened. Basal plate very wide, wider than head, about three and a half times, or a little more, wider than long. Prehensors when closed with claws almost even with front margin of head; joints all unarmed. Anterior median margin of prosternum armed with two stout conical teeth. Spiracles all circular, the first not specially enlarged, those of ultimate segments becoming very small. Last ventral plate rather narrow, short, caudal margin a little incurved. Coxopleural pores large, eight or more on each side, mostly scattered over coxopleura, free from plate but a few covered by edge of the latter. Anal legs short, ending in stout claws. Pairs of legs, one hundred and twenty-five.

Locality.—Sausalito.

Family Geophilidae

In this family the labrum is tripartite, the middle piece varying in relative size. The mandible bears but a single pectinate lamella and no dentate lamella. The coxæ of the first maxilla are coalesced at the middle. No suprascutella are present. The subfamilies represented in California may be distinguished by means of the following key:

Key to Subfamilies

- a. The coxosternum of second maxilla with halves nearly separated at middle; on each side a strongly chitinized suture running from the ceto-caudal angle cephalo-mesad (pleuro-sternal suture). Subfamily *Chilenophilinae*

aa. Coxosternum with halves well united at middle; no such pleuro-sternal suture present.

b. First maxillæ without lappets; middle piece of labrum very large, overlapping the ends of the short lateral pieces, which are unarmed, dentate along its anterior edge; dorsum not bisulate.

Subfamily *Linoteniinae*

bb. First maxillæ with well developed lappets; middle piece of labrum small, the dentate margin caudad, lateral pieces pectinate, dorsum biculate.

Subfamily *Geophilinae*

Subfamily *Geophilinae*

The two California genera belonging to this subfamily may be separated thus:

Key to Genera

a. Joints of prehensorial feet not dentate within; anal legs ending in claws.

Genus *Geophilus* Leach

aa. Joints of prehensorial feet dentate within; anal legs not terminating in claws, the claw being replaced by a small seventh article.

Genus *Arenophilus* Chamberlin

Genus *Geophilus* Leach

In this genus the prehensorial feet, for the most part, do not extend beyond the front margin of the head and are unarmed within or with but rudiments of denticles at base of claw. The basal plate is wide. In most species the last ventral plate is wide but in some it is but moderate or even narrow. The anal legs end in claws. The middle piece of the labrum is usually dentate and the lateral ones pectinate. In the species here included as belonging to the Californian fauna the ventral pores are numerous and arranged in a transverse band immediately in front of the caudal margins of sternites.

The three known Californian species may be separated by means of the following key.

Key to Species

a. Prebasal plate exposed; last ventral plate very wide; coxopleural pores in adults covered by edge of ventral plate.

b. All spiracles circular; claws of prehensorial feet extending beyond front margin of head.

G. rubens Say.

bb. Anterior spiracles elliptical; claws of prehensorial feet not extending beyond front margin of head.

G. regnans Chamberlin

aa. Prebasal plate not exposed; last ventral plate narrow; coxopleural pores small, a dozen or more on free surface of coxopleura.

G. nasutus Chamberlin

Geophilus rubens Say.

Robust; attenuated caudad but not cephalad. Typically there is a geminate and often interrupted black band along the dorsum, though this may be entirely

absent; the body otherwise testaceous, the head with prehensorial feet darker as usual. The spiracles are all circular. In the eastern states, where this species is common, the pairs of legs number most frequently forty-nine to fifty-one in the male and fifty-one to fifty-three in the female; but in Californian specimens studied, the numbers are most frequently fifty-nine to sixty-one, though in one specimen but forty-seven were present.

Two of the Californian specimens studied were collected on a sandy beach at Pacific Grove by Miss Helen Nagel of Stanford, to whom I am indebted for the same. They are large specimens which are paler than usual and lack the dorsal dark band. The author has collected it also at Oroville (April, 1911). A specimen collected at Claremont is among material received from Prof. Baker. Wood reported three specimens, presumably this same species, from the Santa Cruz Mountains under the name *G. laevis*.

Geophilus regnans Chamberlin

A large species in which the body is wide anteriorly and attenuated caudad much as in the preceding species. The anterior spiracles are obliquely elliptical, the median and caudal ones circular. The number of pairs of legs is mostly from seventy-seven to eighty-five, seventy-nine and eighty-one being perhaps commonest. The length may be up to 70 mm.

Evidently an abundant species in southern California. Numerous specimens have been seen from the following localities: Claremont (Baker), Los Angeles and Pacific Grove (author). It seems to be the commonest *Geophilio* about Claremont.

Geophilus nasintus Chamberlin

Of nearly same form as the preceding, being narrowed but little cephalad and strongly caudad. Fulvous in color, the head and prehensorial feet darker, reddish. No frontal suture evident. The claws of the prehensorial feet when closed about even with the front margin of the head. Spiracles all circular. The pairs of legs in the type specimen number seventy-three and the length of body is 42 mm.

The exact locality from which the type came is uncertain; but the vial was among material from southern California received from Prof. Baker and is assumed to be from that region.

Genus *Arenophilus* Chamberlin

In the species belonging to this genus at present known a frontal suture is evident and the prebasal plate is absent or covered. The basal plate is trapeziform and conspicuously narrowed cephalad. The tripartite labrum has the free margin of all the divisions pectinate, the processes of the lateral ones being long and close set. The prehensorial feet are large and much exposed from above and the claws when closed extend well beyond the front margin of the head; the articles dentate within. The ventral pores are numerous and arranged in a single condensed area on each sternite upon which occurring. The last ventral plate is very wide. Each coxopleura with one or two large pits at or beneath edge of

ventral plate. Anal legs clawless, the claw in each being replaced by a small additional article.

One species occurs, somewhat doubtfully, within the state.

Arenophilus bipunticeps Wood

Cephalic plate truncate caudad and extending over the anterior border of basal plate; bearing two sharply impressed sulci on caudal portion which diverge but little cephalad. Claws of prehensorial feet when closed extending much beyond anterior margin of head, the teeth of joints usually small. First spiracle vertically elliptic, larger than the second; the immediately following spiracles may also be similar in shape, those of more caudal segments becoming gradually circular. Ventral pores in a large area in front of caudal margin which is truncate cephalad and extended angularly at middle caudad. Coxopleuræ typically with two large porigerous pits at each lateral edge of ventral plate; in some specimens the more caudal pit on each side may be broken into two distinct but contiguous pits.

A large species which has a large head from which the body is narrowed caudad.

Two specimens in a vial containing no locality label but among others from Claremont and undoubtedly collected at that place. In the eastern section of the United States this is one of the commonest and most widespread members of the suborder.

Subfamily Linoteniinæ

Of the two American genera at present known as belonging to this subfamily, one, *Linotenia*, occurs in California.

The labrum has the middle piece relatively very large and toothed along the margin directed cephalad whereas the side pieces are small, in part overlapped by the median, and with edges wholly smooth or free from teeth or pectinæ. The palpi of the first maxillæ lack lappets. The dorsal plates are smooth, not bisulate as in the preceding subfamily. Ventral pores in a well marked transverse band in front of caudal margin, the band on more caudal segments usually divided at median line.

Genus *Linotenia* C. Koch

This is a compact and clearly delimited genus. The species all have the body decidedly narrowed cephalad with the head small and characteristically narrowed anteriorly. The frontal suture is distinct. Antennæ filiform. The claws of the prehensorial feet, which when closed, do not extend beyond the front margin of head and usually fall considerably short of it, bear at base within each a conspicuously large tooth. The coxosternum, or prosternum, is without lateral chitinous lines. The coxopleuræ bear several to many small pores. The anal legs terminate in claws.

Most species of the genus in life are bright reddish in whole or in part; but in alcohol the red pigment fades leaving the color mostly some shade of brown.

But one species is known at present as occurring in California, this being the large and widespread *L. laevipes* Wood.

Linotenia laevipes Wood

Syn. *Strigamia parviceps* Wood

Strigamia epileptica Wood

Scolioplanes imperialis Brolemann

Linotenia rubelliana Chamberlin

This handsome species occurs throughout most of California and ranges northward into Washington. It may attain a length of 90 mm. or more. In life the entire animal is red, but quickly fades in alcohol, the head with prehensorial feet and antenna usually retaining a deeper color. The body is robust and conspicuously attenuated at the ends as usual. While usually free, the caudal angle of the head may be covered by the basal plate, this being more frequently the case apparently in the males than in the females. The tooth at base of claws

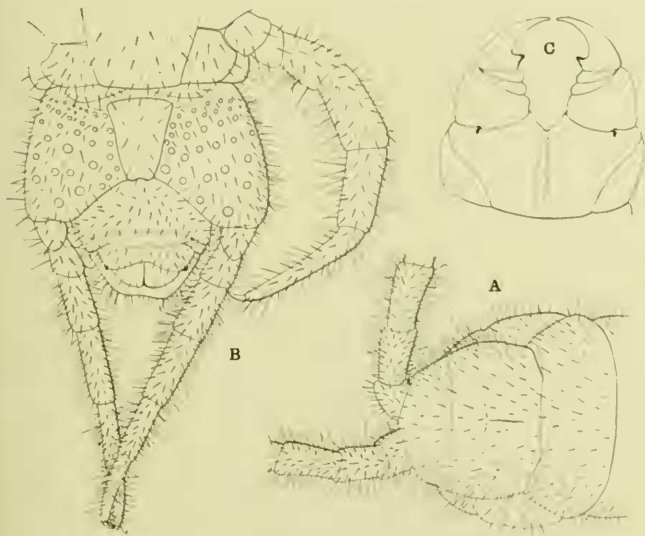


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A, Dorsal view of anterior region of a female specimen of *Linotenia fulva* (Sager) from Saluda, N. C., showing cephalic plate crossed by frontal suture, the broad basal plate overlapping the caudal angle of the cephalic, the prehensorial feet partly exposed at sides of head, and the proximal portion of antennae. B, Ventral view of the posterior end of the same specimen, showing the enlarged coxopleurae pierced by the numerous coxopleural pores, the narrow last ventral plate or sternite between them, etc. C, The prosternum and prehensorial feet of the Californian *Linotenia laevipes* (Wood), showing the characteristically large tooth at the base of each claw within.

of prehensorial feet very large (see figure). Spiracles all circular, the first not visibly larger than the second. Last ventral plate very wide, strongly narrowed caudad. Coxopleuræ with numerous small pores and usually on two larger ones, all arranged along and beneath the edges of the ventral plate. In immature specimens often only the two larger pores on each side evident. Anal legs in female slender, about equalling the penult in length, ending in a long claw; in the male greatly enlarged and flattened dorso-ventrally. In the Californian specimens examined the number of pairs of legs varies mostly from sixty-nine to seventy-five but often falls to sixty-seven and may be as large as ninety-one, as in a specimen from Oroville.

I have seen specimens from the following localities: Oroville, Pacific Grove, Berkeley, Stanford and Santa Barbara (author's collection), and from Claremont (Prof. Baker).

Subfamily *Chilenophilinæ*
(*Ribautiina* of Brolemann)

This recently established subfamily is proving to be a large one, a considerable number of genera now having been found to belong to it. The group is readily distinguished by characters of the second maxillæ, these having the two halves of the coxosternum almost separated at the middle and each presenting a very conspicuous, strongly chitinized suture extending from the caudo-external angle meso-cephalad. Three genera are represented in California.

Key to Genera

- a. Side pieces of labrum extending over the middle one and meeting at the median line; and legs ending in a strongly developed claw.

Genus *Gnathomerium* Ribaut

- aa. Side pieces of labrum completely separated by the middle one; anal legs clawless or ending in a rather weakly developed claw.

- b. Femur of palpus of second maxillæ with a distinct process at distal meso-dorsal angle; anal legs ending in a small membranous seventh article which replaces the claw. Genus *Watophilus* Chamberlin

- bb. Femur of palpus of second maxillæ with no such process; anal legs with but six joints and clawless or with a weak claw.

Genus *Taiyuna* gen. nov.

Genus *Gnathomerium* Ribaut

This genus is represented in North America by several species of which one is known to occur in California. A second species, *G. utahensis* Chamberlin, common in Utah, may range into the mountains of this state.

The species of this genus are typically widest anteriorly and attenuated from the head caudad. The lateral pieces of the labrum extend mesad over the middle piece and are contiguous with each other at the middle line, the edge of the middle piece bearing teeth which project out from beneath, the lateral pieces fringed with pectinæ. Palpus of second maxilla triarticulate, all articles lacking special processes. Ventral pores not in definite areas. The anal legs consist of the usual six articles, the ultimate ending in a well developed claw.

Gnathomerium melanonotum WoodSyn. *Mecistocephalus limatus* Wood*Mecistocephalus quadratus* Wood*Geophilus glaber* Bollman

This is a widespread species on the Pacific Coast, ranging throughout most of California and northward to Canada. It is conspicuously attenuated from the head caudad, resembling in its proportions a *Mecistocephalus*. The head and antennae are reddish brown, the latter tipped with pale; the body is of the usual brownish yellow color but having in most a decided greenish or olivaceous tinge; along the dorsum there is commonly a black stripe which is mostly geminate or double. The cephalic plate is attenuated caudad, widely rounded posteriorly. Frontal suture distinct. Prebasal plate not exposed. The claws of the prehensorial feet when closed extend beyond the front margin of the head much; first joint and claw armed within with well developed teeth, the intermediate articles with inconspicuous denticles. The first spiracle nearly circular, being slightly vertically elliptic, and it is much larger than the second. The last ventral plate is moderately wide. The coxopleurae bear a number of mostly small pores both below and above. The number of pairs of legs varies mostly from forty-seven to fifty-five, forty-nine and fifty-one being common, and in the southern part of the state the number ranges prevailingly from fifty-nine to sixty-five pairs. Adults mostly from 35 to 50 mm. in length.

Specimens from within the state have been seen from the following localities: Shasta Springs, Oroville, Pacific Grove, Point Lobos, Sausalito, Berkeley and Stanford (collected by writer), and from Claremont and neighboring mountains (Prof. Baker, collector).

Genus **Taiyuna** gen. nov.

Head large, the body scarcely narrowed cephalad, strongly so caudad. The labrum with side pieces lapping well over the ends of the middle one but not contiguous mesally; middle pieces with many closely set, stout spines on free edge, the lateral pieces with comparatively few, these being bent strongly mesad. Palpi of first maxilla with long membranous lappets. Palpi of second maxilla wholly without processes. Ventral pores not detected. Last ventral plate narrow. Coxopleurae with a number of small pores. Anal legs composed of six articles beyond Coxopleura; claw absent or rather slender if present.

Type.—*Taiyuna occidentalis* Meinert.

Taiyuna occidentalis MeinertSyn. *Geophilus californiensis* Bollman.

This species is widespread in the state and shows corresponding variation. The number of pairs of legs in specimens about San Francisco, the type locality, varies from sixty-seven to seventy-five, seventy-one and seventy-three being commonest; but, as usual with members of the group, in going south the number increases. At Los Angeles the author found individuals with as high as eighty-seven pairs (*isantus* Chamb., var.) which seemed distinct until more abundant

material indicated intergradation. Mr. Bollman's *californiensis* seems to have been based on partly grown specimens of this species, his description agreeing completely with such so far as it goes.

Body as wide or nearly as wide anteriorly as at the middle, but strongly narrowed caudad. Head and prehensorial feet with prosternum brownish red; antennae brown, pale distad; body fulvous, more brownish cephalad; legs yellow. Cephalic lamina longer than wide, narrowed from in front caudad. Prebasal plate not evident, the cephalic overlapping the anterior border of the basal. Claws of prehensorial feet when closed reaching well beyond the first antennal article; first joint of prehensor with a tooth at meso-distal angle, the claw at base also with a somewhat smaller tooth. In large specimens the first spiracle is distinctly vertically elliptic and much larger than the second, all others circular. The last ventral plate moderate in width, longer than wide, narrowed caudad. Coxopleure with from four or five to thirty-nine or so, the larger numbers occurring in individuals not fully grown; some of the pores usually covered by edges of ventral plate, while one, often larger, usually stands apart from the rest on the more caudal surface of the coxopleura. Pairs of legs sixty-seven to eighty-seven. Length up to nearly 70 mm.

Localities.—San Francisco, Sausalito, Berkeley, Stanford, Pacific Grove, Monterey, Santa Barbara and Los Angeles, collected by the writer. A single specimen is also in the material received from Pomona College (Pillsbury, collector).

Taiyuna claremontus Chamberlin

This species is known from but few specimens, mostly from Claremont. It differs from the preceding in having the anal legs armed with a distinct claw. The number of pairs of legs in the type is sixty-five and the length 49 mm.

Genus *Watophilus* Chamberlin

Labrum with middle piece fully separating the lateral. First article of palpus and coxa at disto-cetral angles bearing long lappets. Coxae of second maxillae nearly separated mesally; the palpus with femur at meso-dorsal distal angle with a conical process and usually the succeeding article less distinctly produced at disto-cetral angle. Prosternum without chitinous lines. Claws of prehensorial feet extending beyond front margin of head; articles of feet dentate within. Ventral pores absent. Last ventral plate wide. Coxopleural pores small, few. Anal pores present. Anal legs clawless, the claw being replaced by a small, membranous, seventh article. There is a tendency for the number of pairs of legs to be fixed for each sex in each species, variations from this mode not being frequent. The two California species known may thus be separated.

Key to Species

- a. Pairs of legs forty-one to forty-three; exposed portion of basal plate eight times wider than long. *W. errans* sp. nov.
- aa. Pairs of legs forty-seven to fifty-five; exposed portion of basal plate about three and one-half times wider than long. *W. lactus* sp. nov.

Watophilus errans sp. nov.

A small species under 13 mm. in length and seeming to have constantly forty-three pairs of legs in the female and forty-one in the male. The body is yellowish white with the head of a pale reddish cast. The cephalic plate is elongate with the sides weakly convex, a little converging at ends, more so cephalad; caudal border truncate, overlapping considerably the basal plate, the exposed portion of which is very short, being eight times wider than long, and is marked with a distinct longitudinal median sulcus. No frontal suture is present. The antennae are short and strictly filiform. The claws of the prehensorial feet when closed extend beyond front margin of head; claw armed at base with a stout conical tooth, the first joint armed near distal end with a somewhat larger conical tooth. First spiracle subelliptic, larger than the second, others circular. Last ventral plate wide. Coxopleural pores small, few, mostly covered.

Locality.—Berkeley, Cal., (author, April, 1911).

Watophilus lætus sp. nov.

Head with sides nearly parallel, a little converging caudad, but slightly excurved; caudal margin truncate. The anterior nearly so; corners not strongly rounded; much longer than wide (5:4). Basal plate much covered by cephalic, the exposed portion about three and one-half times wider than long, one-quarter as long as head. Antennae longer than in the preceding species. Claws of prehensorial feet when closed extending a little beyond front margin of head; tooth of claw small. Prosternum wider than long (11:9). Last ventral plate wide, sides converging caudad, caudal margin a little incurved. Coxopleura pores few, partly covered. Distal joint of anal legs long and slender. Anal legs in male crassate proximally, the four distal articles slender. Pairs of legs, forty-seven to fifty-five. Length about 15 mm.

Localities.—Stanford (Mann), Pacific Grove and Berkeley (author). The type is from Berkeley.

Family Soniphilidae

Of the three genera at present known to belong to this family, two occur in California. They are characterized by having a coalescence between the parts of the labrum, the middle piece widely extending along the lateral to their outer ends in most cases where, at least fusion is evident; at the middle of the free edge two decidedly larger and more strongly chitinated teeth are borne, the adjacent ones being abruptly smaller, these middle teeth with in some several adjoining pairs in two of the genera extending directly; ventrad rather than caudad; lateral portions of edge pectinate. The first maxillae may or may not bear well developed lappets. Second maxillae without pleuro-sternal suture, the coxae broadly joined at middle. Chitinous lines of prosternum strongly developed. Anterior border of each anterior sternite is furrowed transversely, the furrow being guarded ventrally as a rule by a chitinous rim or flange beneath which fits the edge of the preceding plate.

The three genera may be separated by means of the following key:

Key to Genera

- a. Joints of prehensorial feet not dentate within; claws not extending beyond the front margin of head; last ventral plate very wide.
 - b. Edge of labrum bent centrad at middle, its teeth extending in same direction; coxa of first maxilla without lappet, the proximal article of palpus with a conical process or lappet which is shorter than the distal article.

Genus *Soniphilus* Chamberlin
 - bb. Edge of labrum at middle with teeth directed caudad; first maxilla with coxa and proximal joint of palpus with long lappets.

Genus *Tabiphilus* gen. nov.
- aa. Some joints of prehensorial feet dentate within; claws when closed extending beyond front margin of head; last ventral plate but moderate in width.

Genus *Poaphilus* Chamberlin

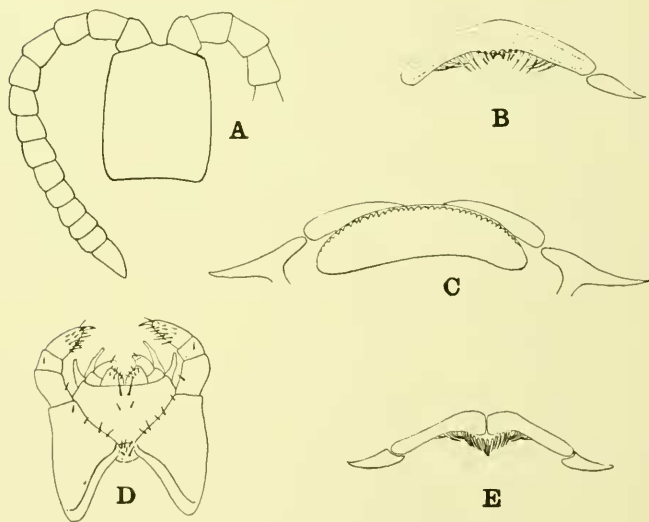


Figure 218

A, Dorsal view of cephalic plate and antennae of *Soniphilus secundus* sp. nov. B, Cephalo-ventral view of labrum of the same, showing the two large middle teeth and the outlines of the lateral pieces over which the median extends. C, Labrum of *Linotenia levipes* (Wood), showing the large median piece which is dentate along the edge directed anteriorly, and the smooth lateral pieces with the lateral supports or laminae fulcrales. D, First and second maxillae of *Gnathomerium melanonotum* (Wood), showing the divisions of the first with the membranous lappets on each side, and, in the second, the conspicuous pleura-sternal sutures. E, Labrum of the same, showing how the lateral pieces extend over the median and meet at the median-line.

Genus *Soniphilus* Chamberlin

This genus as at present known embraces two species, the one described below and *S. embius* Chamberlin, the type of the genus, a closely related species from Iowa which is but 13 mm. long. In this genus the prehensorial feet are short, not attaining the front margin of the head, and its joints are all unarmed within. The first maxillae have but one lappet on each side, this being an outgrowth from the proximal article of the palpus. The last ventral plate is very wide. Coxopleural pores few and small, mostly covered by the edge of the ventral plate.

Soniphilus secundus sp. nov.

Chitinous lines of prosternum not wholly complete. Claws of prehensorial feet with a minute or obsolete denticle within, not attaining front margin of head. Cephalic plate widest a little in front of caudal margin, narrowing moderately forward. Frontal suture not present. Basal plate very wide. Prebasal plate not exposed. The labrum has two very stout conical teeth at middle, the adjacent processes being abruptly less strongly chitinized and longer like those of lateral fringes. Spiracles all circular, the first larger than the second. First legs a little shorter and more slender than the second. Last ventral plate very wide, narrowed caudad. Two moderate sized pits on each coxopleura covered, or mostly so, by edge of last ventral plate. Anal legs in female slender, longer than the penult, ending in a well developed claw. The body is attenuated strongly caudad and less strongly, though considerably, cephalad. Fulvous; head light reddish yellow; antennae yellow. Length ad 18 mm. Pairs of legs, in female forty-three, male forty-one.

Localities.—Sausalito (author, April, 1941), Pacific Grove (author, July, 1909).

As indicated previously, this species is very close to the type species *S. embius* found in Iowa and Wisconsin; but it differs clearly in the character of the armature of the labrum, in the shape of the cephalic plate, in the larger basal plate and in details of the last ventral plate and the coxopleurae. The chitinous lines of the prosternum are also less strongly developed.

Tabiphilus gen. nov.

This genus is in general structure most clearly allied with the preceding; but it differs in having the edge not twisted ventrad at the middle, the teeth extending caudad as in most genera and not having the middle two quite so strongly differentiated from the others, and clearly in having two long membranous lappets on each of the first maxilla, the distal lappet being clearly longer than the distal article of the palpus. The one species known is larger and has a much larger number of pairs of legs than any one in the two other genera of the family.

Tabiphilus rex sp. nov.

Body light ferruginous. Attenuated cephalad and more decidedly caudad. The cephalic plate is truncate anteriorly and also posteriorly; the sides are straight and parallel from the caudal angles forward to about the beginning of

the anterior third where they round in mesad to the anterior margin; longer than wide in ratio 17:15. Frontal suture not present. Antennae three times as long as the cephalic plate; proximal article wide, nearly touching its fellow; ultimate article equalling in length the two preceding taken together. Prebasal plate very slightly exposed. Basal plate three and eight-tenths times wider than the median length of the exposed portion. Claws of prehensorial feet when closed not attaining front margin of head; joints unarmed. Chitinous lines of prosternum strongly developed; prosternum much wider than long (about 4:3). Ventral pores few, in a transverse band in front of caudal margin of sternite. Legs of first pair a little shorter and more slender than those of the second, the succeeding few pairs gradually a little longer and thicker; anterior pairs clearly more robust than the posterior. First spiracle obliquely elliptic, larger than the second which with all the succeeding ones is circular. The last ventral plate is very wide with its sides convex, the caudal margin subtruncate. Coxopleural pores mostly covered, one or two only being partly exposed. Anal legs much stouter and longer than the penult. Pairs of legs, seventy-five. Length about 30 mm.

The type specimen was taken at Claremont by Prof. Baker and is the only specimen of the species seen.

Family Schendylidae

In this family the antennae are thin and filiform. The labrum is composed of a single piece, the free edge of which is concave and dentate. Mandible with one dentate lamella, which may be divided into three parts, and one pectinate lamella. Suprasentella never present. The ventral pores when present, as they are in all Californian forms, are condensed in a circular or elliptic area.

Pectiniunguis is the only genus now known to occur in California; but *Schendyla* is likely to occur. These two genera may be separated as follows:

Key to Genera

- a. Claw of second maxilla excavated and pectinate; dental lamina tripartite; coxosterna of first and second maxillae grown together.

Genus *Pectiniunguis* Bollman

- aa. Claw of second maxilla not excavated on one side and pectinate; dental lamina of mandible entire; coxosterna of first and second maxilla not grown together.

Genus *Schendyla* Bergsøe and Meinert

Genus *Pectiniunguis* Bollman

Labrum entire, deeply incurved, mesally dentate. Mandible with dentate plate in three divisions. Coxosterna of first and second maxillae fused together. Claw of palpus of second maxillae concave on mesal side and finely pectinate along the ventral pores in a small circular field in front of caudal margin of sternites. Last ventral plate wide, each coxopleura with two porigerous pits at or beneath edge of ventral plate. Anal legs six jointed, with or without claws.

Key to Species

- a. Anal legs without claws. *P. americanus* Bollman
aa. Anal legs with claws.

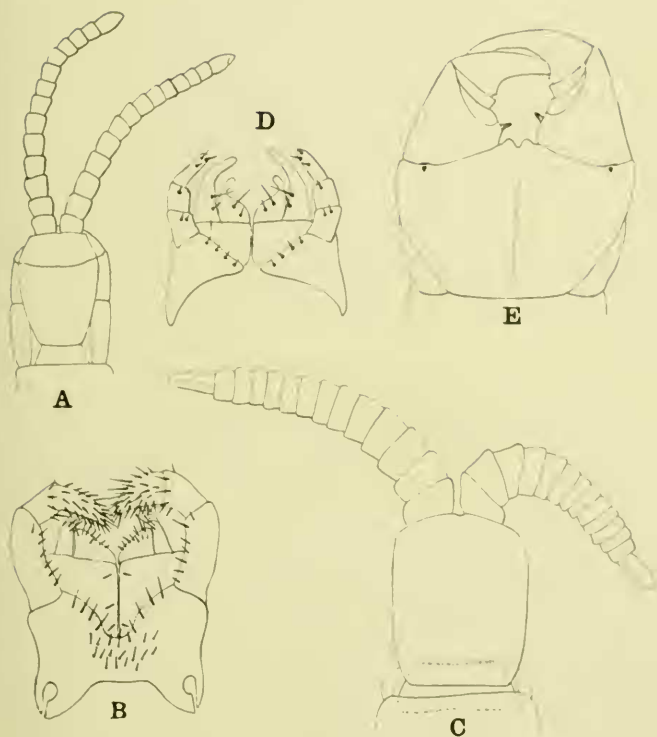


Figure 219

A, Dorsal view of anterior end of *Mecistocephalus limatus* (Wood), showing the characteristic form of cephalic plate and its frontal suture, the narrow basal plate with the pleurae exposed each side, the much exposed prehensorial feet, and the antennae. B, First and second maxillae of the same showing the separation of the coxae of the first and the long palpus membranous apically and bearing no lappets; note also the extensive fusion of coxae of second maxillae. C, Dorsal view of anterior end of *Arrup pylorus* gen. et sp. nov., with the prehensorial feet removed; it shows the cephalic plate with antennae, the much overlapped basal plate with the pleurae each side. D, First and second maxillae of the same, showing particularly the complete separation of the coxae of the second pair as well as those of the first; contrast with B. E, Prehensorial feet and prosternum of the same; note the characteristic teeth borne on mesal margin of first joint.

- b. Prebasal plate not exposed; pairs of legs, forty-five to fifty-three.
- c. Basal plate, so far as exposed, but four times wider than long; cephalic plate longer than wide. *P. heathi* Chamberlin
- cc. Basal plate very short, exposed portion about eight times wider than long; cephalic plate nearly equal in length and breadth.
P. heathi catalinae subsp. nov.

Pectiniunguis americanus Bollman

While this species has not been taken actually within the state, it was originally described from Lower California and its occurrence within our limits is therefore very probable. In this species the body is depressed and but little attenuated. It is brownish yellow in color with an interrupted geminate dark band along the dorsum. The cephalic lamina is equal in length and breadth, with the caudal margin a little incurved. Prebasal plate exposed. Spiracles large, elliptical. Coxopleural pits covered by last ventral plate. Anal legs entirely without trace of claws. Pairs of legs near sixty-five.

Pectiniunguis montereus Chamberlin

This species seems to occur quite commonly along the California coast from the southern portion north at least as far as Monterey Bay, from which it was first described. It is essentially littoral in habit, though it has been occasionally taken some distance inland. Specimens have been seen from the following localities: Dead Man's Island, San Pedro, (Baker); Santa Barbara, Pacific Grove, etc. (author).

In general structure similar to *P. americanus*. In alcohol specimens are light brown to yellowish with the head somewhat darker. There may be two parallel dark stripes along the dorsum as in the preceding species. In life the adults are deeper colored, some appearing red like a *Linotenia*. The body is decidedly though very gradually attenuated cephalad and more abruptly caudad. The prebasal plate exposed. Cephalic plate considerably longer than wide, truncate caudally. Ultimate article of antennae shorter than the two preceding taken together. Pairs of legs, so far as noted, fifty-five to sixty-one. Length up to 50 mm.

Pectiniunguis heathi Chamberlin

Body of same general habit as the preceding but smaller. Cephalic plate with sides widely excurving. Prebasal plate not exposed, the cephalic lapping over the basal. Ultimate article of antennae about equal in length to the two preceding taken together. The first ten sternites have each a caudal median process which fits into a corresponding pit in the succeeding plate, this feature apparently more strongly developed than in *monereus*. Pairs of legs, forty-five to fifty-three. Length 22 mm.

Known from Cypress Point, Monterey County, where a specimen was dug up from an Indian mound in sandy soil, and from Los Angeles, where the author secured a specimen also by digging.

Pectiniunguis heathi catalinae subsp. nov.

Head yellowish; antennae and body pale yellowish white. Cephalic plate widest anteriorly, narrowed caudad; anterior margin rounded, the caudal truncate; equal in length and breadth or very nearly so. Basal plate largely covered by the cephalic, the exposed portion being very short, about eight times wider than long. Claws of the prehensorial feet when closed extending a very little beyond front margin of head; joints of feet all unarmed. Prosternum with chitinous lines; wider than long (about 23:17). Antennae strictly filiform, not at all attenuated. Last ventral plate wide, sides converging caudad. Coxopleural pits two on each side, covered by edge of ventral plate. Anal legs in male crassate, ending in a claw. Pairs of legs, forty-five to fifty-one. Length about 16 mm.

Localities.—Catalina Island; Claremont (Baker).

Family Himantariidae

Antennae short, strongly flattened, broad at base and markedly attenuated distad. Labrum well developed, composed of a single piece which is free, and incurved and dentate along the margin. Mandible with a single dentate and with several pectinate lamellae. Prehensorial feet weakly developed, not dentate within. The ventral pores are in a sharply delimited central area. Anal pores never present.

The two genera included in the key below are the only Californian genera at present known; but *Haplophilus*, which is known from Montana and Mississippi, may be found to occur.

Key to Genera

- a. Anal legs ending in small claws; on some of the middle segments supra-scutella are present. Genus *Notobius* Cook
aa. Anal legs clawless; no suprascutella present. Genus *Gosiphilus* gen. nov.

Genus *Notobius* Cook

Some of the segments in middle portion of the body with a row of supra-scutella or paratergites above the level of the spiraculiferous sclerites. Labrum deeply incised at median line. Coxosternum of first maxillae deeply incised at middle, almost completely divided but still coalesced proximally. Last ventral plate very wide; coxopleural pores numerous, small, arranged along edge of ventral plate. Spiracles all circular. Anal legs terminating in a slender claw in adults.

One species known. A second form, *inermis* of Wood, is listed here tentatively.

Notobius teniopsis Wood

Syn. *Chomatobius mexicanus* Seliwanoff

Notobius californicus Cook

This is a very long species with from one hundred and twenty-nine to one hundred and forty-nine pairs of legs in individuals thus far observed, most having from one hundred and thirty-three to one hundred and forty-one pairs. Con-

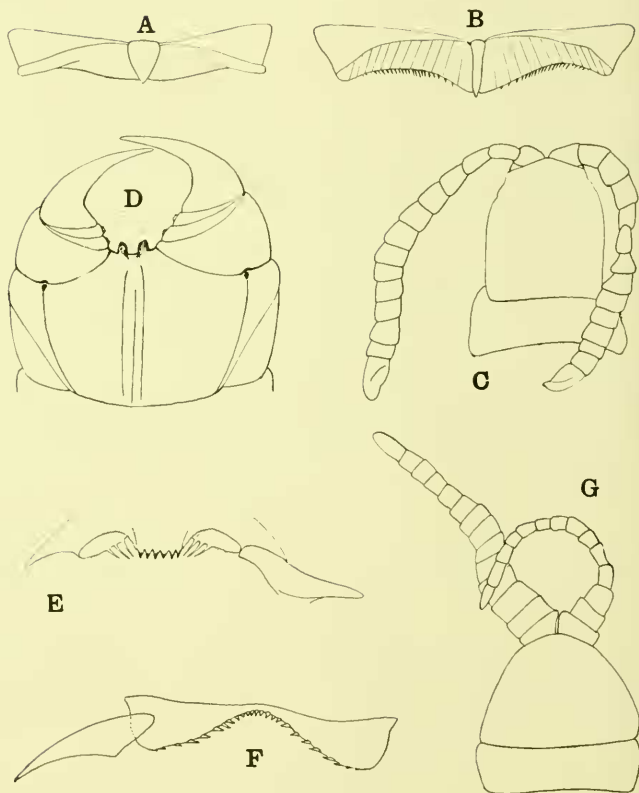


Figure 220

A, Labrum of *Arrup pylorus* gen. et sp. nov. B, Labrum of *Mecistocephalus limatus* (Wood). C, Dorsal view of cephalic and basal plates with antennae of *Tampiya pylorus* gen. et sp. nov. D, Prosternum and prehensorial feet of the same, showing the characteristic teeth of the anterior median margin of the prosternum. E, Labrum of the same. F, Labrum of *Pectiniunguis monterei* Chamberlin, showing also one lamina fulcients. G, Dorsal view of anterior end of *Gosiphilus minor* gen. et sp. nov., showing basal and cephalic plates with antennae, the prehensorial feet being completely covered.

spicuously narrowed from third fourth of length cephalad and abruptly narrowed caudad; the head relatively very small. The cephalic plate is relatively wide, well rounded in front, almost completely concealing the prehensorial feet from above. The flat antennae are short, contiguous at base and pointed distad. Claw of prehensorial feet not attaining front margin of head. Ventral pores in a sharply delimited median area which varies from circular to transversely elliptical in outline. Last ventral plate very wide, the numerous small coxopleural pores aggregated mostly along its edges.

Specimens have been seen by the author from Stanford, Claremont and Los Angeles. It is also known from San Diego and Margarita Island.

Notobius inermis Wood

Under the name *Himantarium inermis*, Wood described an individual from the Santa Cruz Mountains. He states that it is very similar to *teniopsis* but differs in having only one hundred and fifteen pairs of legs. The head is described as triangular and moderately wide, the antennae short and said not to be acuminate. Feet robust, short.

Genus *Gosiphilus* gen. nov.

Body much flattened dorso-ventrally. Labrum deeply incised at middle. The coxosternum of first maxillar deeply incised at median line but coxae not separated proximally. Dentate plate of mandible rather narrow. Paratergites or supra-seutella absent. Last ventral plate wide. Coxopleural pores few, mostly covered. Anal legs clawless.

Apparently most closely allied with *Haplophilus*. Established for three species, all of which occur in California and two of them known from nowhere else.

Key to Species

- | | |
|--|---------------------------|
| a. Pairs of legs near one hundred and eighty-one. | <i>G. bakeri</i> sp. nov. |
| aa. Pairs of legs less than one hundred. | |
| b. Pairs of legs mostly fifty-five to sixty-one. | <i>G. minor</i> sp. nov. |
| bb. Pairs of legs in the neighborhood of eighty-one. | <i>G. laticeps</i> Wood |

Gosiphilus minor sp. nov.

Cephalic plate widest caudad, conspicuously narrowed anteriorly, sub-triangular, wholly covering the prehensorial feet; caudal margin weakly produced from lateral corners to a very obtuse angle at middle; much wider than long (as 31:23). Basal plate very wide, narrowed from its anterior end caudad, two and one-half times wider than long. Antennae short, thick, contiguous at base. Prosternum much wider than long (28:17); chitinous lines very strongly developed. Prehensorial feet weak, joints unarmed, claws not attaining front margin of head. Spiracles all circular, the first considerably larger than the second. Ventral pores in a sharply defined transversely elliptical area. Last ventral plate very wide, almost wholly covering the coxopleurae, subquadrate, the sides but slightly converging caudad. Coxopleural pores few, partly covered. Anal legs in male

crassate, clavate, the apical portion conspicuously thicker than the proximal. In the female slender, not attenuated distad. Pairs of legs, fifty-five to sixty-one.

Locality.—Berkeley (author, April, 1911).

Gosiphilus bakeri sp. nov.

Cephalic plate widest caudad, being a little narrowed cephalad to anterior corners, the border in front of corners triangular; wider than long (in ratio 15:13). Basal plate short, a little narrowed caudad, not quite as wide as the cephalic, about two and eight-tenths times wider than long. Prehensorial feet completely covered by cephalic and basal plates; claws weak, not strongly curved, not touching distally, short of attaining front margin of head. Prosternum very much wider than long (28:15); chitinous lines strongly developed and complete as usual. Spiracles all circular. Ventral pores in a circular or subcircular area just caudad of center of sternites. Last ventral plate wide, sides straight, moderately converging caudad; caudal margin truncate. Coxopleural pits two on each side, the more caudal one partly covered and the anterior one wholly so by ventral plate. Anal legs clawless. Pairs of legs, one hundred and eighty-one.

One specimen from Claremont collected by W. C. Spencer.

Gosiphilus laticeps Wood

A long and slender species with the body conspicuously flattened dorso-ventrally. Pairs of legs somewhere near eighty-one, which is a common number. The antennae are short and conspicuously attenuate distad, contiguous at base. The cephalic plate is wide caudad and strongly narrowed forward. Spiracles small, all circular. Ventral pores in a transversely elliptic area. Last ventral plate wide, sides straight, moderately converging caudad. Coxopleural pores usually, at least, not evident.

Specimens have been examined from Pacific Grove, Claremont, Los Angeles and Catalina Island. It is common in Texas, the type locality, and the author has also secured it at Las Vegas, Nevada, where it was dug up in a garden.